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- [c11] 11. The method of claim 10 wherein the metallic particles are sprayed onto the freeze-cast substrate by a spray forming technique.
- [c12] 12. The method of claim 11 wherein the spray forming technique is selected from the group consisting of cold spraying, flame powder, flame wire, arc-spraying, plasma-spraying, high-energy plasma-spraying, vacuum plasma-spraying, detonation, and high-velocity oxyfuel.
- [c13] 13. A method for producing a freeze-cast substrate, the method comprising:
(a) introducing a slurry into a mold unit comprised of a mold contained within a casting receptacle;
(b) placing insulation material around at least a portion of the casting receptacle to minimize distortion in the freeze-cast substrate by controlling temperature gradients within the mold unit; and
(c) lowering the temperature of the slurry to freeze the slurry to form a freeze-cast substrate.
- [c14] 14. The method of claim 13 wherein the insulating material has a thermal conductivity of about 0.04 w/m K or less.
- [c15] 15. The method of claim 13 wherein a chilling apparatus is provided for the lowering step.
- [c16] 16. The method of claim 15 wherein the chilling apparatus is comprised of a freezer.
- [c17] 17. The method of claim 16 wherein the chilling apparatus includes a temperature controller for adjusting the temperature within the chilling apparatus.
- [c18] 18. A mold unit for producing a freeze-cast substrate from a slurry, the mold unit comprising:
(a) a mold;
(b) a substrate receptacle having a base panel and four interconnected side panels being substantially perpendicular to and connected with the base panel, the base panel having a receiving surface for receiving the mold, and each side

panel having an inner and outer surface; and

(c) a layer of insulating material provided around at least a portion of the outer surfaces of the side panels for minimizing distortion in the freeze-cast substrate by controlling temperature gradients within the mold and slurry.

[c19] 19. The mold unit of claim 18 wherein the insulating material has a thermal conductivity of about 0.04 w/m K or less.

[c20] 20. The mold unit of claim 18 wherein the layer of insulating material is comprised of a fiberglass insulating material.

[c21] 21. A mold unit for producing a freeze-cast substrate from a slurry, the mold unit comprising:

(a) a mold having an upper surface and a lower surface;

(b) a substrate receptacle having first and second panel pairs, the first panel pair being substantially perpendicular to the second panel pair, the first and second panel pairs being interconnected, and each panel having an inner and outer surface;

(c) at least two ribs being connected to and substantially perpendicular to the first panel pair, being spaced apart from each other and the second panel pair to form spaced apart regions, and receiving the lower surface of the mold to support the mold; and

(d) insulating material provided in at least a portion of the spaced apart regions for minimizing distortion in the freeze-cast substrate by controlling temperature gradients within the mold and slurry.

[c22] 22. The mold unit of claim 21 further comprising a layer of insulating material provided around at least a portion of the outer surfaces of the first and second panel pairs.